PLANT SPECIES COMPOSITION AT THE BELBULAK MONITORING POINT, ALMATY REGION

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Abstract. The study at the Belbulak monitoring point, located in the Almaty region, focuses on the analysis of plant biodiversity under the influence of pesticides that were previously stored in this area. The vegetation cover comprises 26 families, 82 genera, and 103 species, with the Asteraceae family (Bercht. & J. Presl) being the most dominant. The projective vegetation coverage is 75%, with a significant portion made up of weed species, totaling 70, which represents 66.7% of the total species count. The study also identified 28 forage species, but no endemic species were found. The results underscore the importance of vegetation assessment and monitoring in understanding the impact of anthropogenic activities on ecosystems.
Keywords: biodiversity, pesticides, vegetation cover, monitoring

Studying plant biodiversity in areas with historical pesticide exposure is crucial for understanding long-term environmental impacts. Pesticides used in the past can persist in the soil and continue to affect the environment for decades. Frequent and uncontrolled pesticide use negatively impacts not only the target organisms but also many other species, including non-target plants. Pesticides can remain in the environment, polluting soil, water, and vegetation, eventually leading to a decline in biodiversity and the degradation of ecosystems (Brühl, 2019).

The Belbulak monitoring point, the focus of this study, was previously home to pesticide storage facilities, making it a unique site for analyzing plant species composition. Monitoring biodiversity in such areas is also essential for developing strategies to restore ecosystems and prevent the negative effects of anthropogenic activities. Implementing new approaches to assess the state of flora in polluted areas can contribute to enhanced environmental control and conservation efforts. Therefore, this study adds to the understanding of ecological and biological processes in areas with a high level of anthropogenic pressure.

The object of the study is the vegetation at the Belbulak monitoring point (Fig. 1), located in the Almaty region.

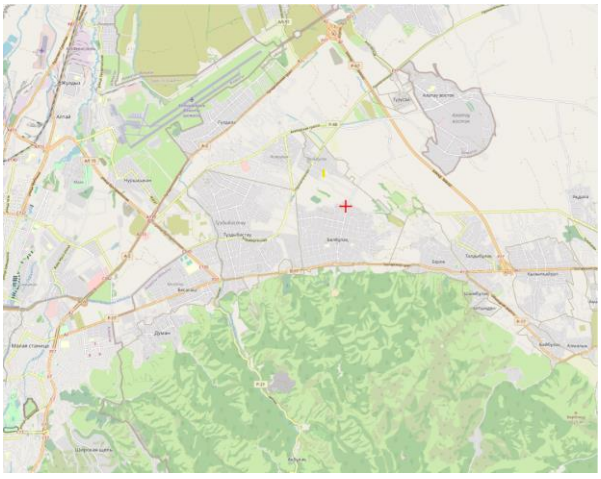

Figure 1 – Location of the Belbulak monitoring point

The research was conducted using the route reconnaissance method combined with a detailed study of experimental sites. To address the research objectives, three typical experimental plots, each with an area of 10 m², were selected in each region. Additionally, three plots with an area of 1 m² were randomly chosen within each site. The main research methods employed were

geobotanical and floristic [Lavrenko, 1959-1972]. During the field surveys, plant lists were compiled.

For species identification, a geobotanical description of the plant communities at the Belbulak point was initially created. The identification of plant species was carried out using fundamental floristic references: "Flora of Kazakhstan," "Illustrated Guide to the Plants of Kazakhstan," and "Guide to the Plants of Central Asia." The nomenclature of taxa follows the general international program "Plants of the World Online" (POWO) at Kew.

In the study area, Point No. 2 – Belbulak, plant diversity was recorded, consisting of 26 families, 82 genera, and 103 species. The Asteraceae family (Bercht. & J. Presl) is the most diverse, comprising 18 genera and 23 pecies. High diversity is also noted in the families Brassicaceae Burnett and Fabaceae Lindl., with 9 genera and 12 species, and 6 genera and 7 species, respectively. The Rosaceae Juss. and Poaceae Barnhart families include 7 and 8 genera, and 9 and 10 species, respectively. Several families, such as Ranunculaceae Juss. and Papaveraceae Juss., are represented by only one genus and species (Table 1).

Table 1 – Quantitative Composition of Plant Diversity at the Belbulak Point

№	Family	Genera	Species
1	Ranunculaceae Juss.	1	1
2	Papaveraceae Juss.	1	1
3	Caryophyllaceae Juss.	2	2
4	Amaranthaceae Juss.	4	6
5	Polygonaceae Juss.	2	3
6	Salicaceae Mirb.	1	1
7	Cucurbitaceae Juss.	1	1
8	Brassicaceae Burnett	9	12
9	Malvaceae Juss.	1	2
10	Ulmaceae Mirb.	1	2
11	Cannabaceae Martinov	1	1
12	Urticaceae Juss.	1	1
13	Euphorbiaceae Juss.	1	2
14	Rosaceae Juss.	7	9
15	Fabaceae Lindl.	6	7
16	Balsaminaceae A. Rich.	1	1
17	Apiaceae Lindl.	5	5
18	Rubiaceae Juss.	1	1
19	Convolvulaceae Juss.	1	2
20	Boraginaceae Juss.	2	2
21	Scrophulariaceae Juss.	1	1
22	Plantaginaceae Juss.	1	2
23	Lamiaceae Martinov	3	3
24	Asteraceae Bercht. & J.Presl	18	23
25	Cyperaceae Juss.	2	2
26	Poaceae Barnhart	8	10
		82	**103**

The Asteraceae family Bercht. & J. Presl is the most widespread in the plant community at the Belbulak point, accounting for more than a fifth of the total genera (18 genera, 21.95%) and species (23 species, 22.33%). It is followed by the Brassicaceae Burnett family, with 9 genera (10.98%) and 12 species (11.65%); Poaceae Barnhart, with 6 genera (7.32%) and 7 species (6.80%); Rosaceae Juss., with 7 genera (8.54%) and 9 species (8.74%); and Fabaceae Lindl., with 8 genera (9.76%) and 10 species (9.71%) (Fig. 2). These families significantly contribute to the overall diversity of vegetation in this region. These data underscore the importance of dominant families in the biological diversity of the area.

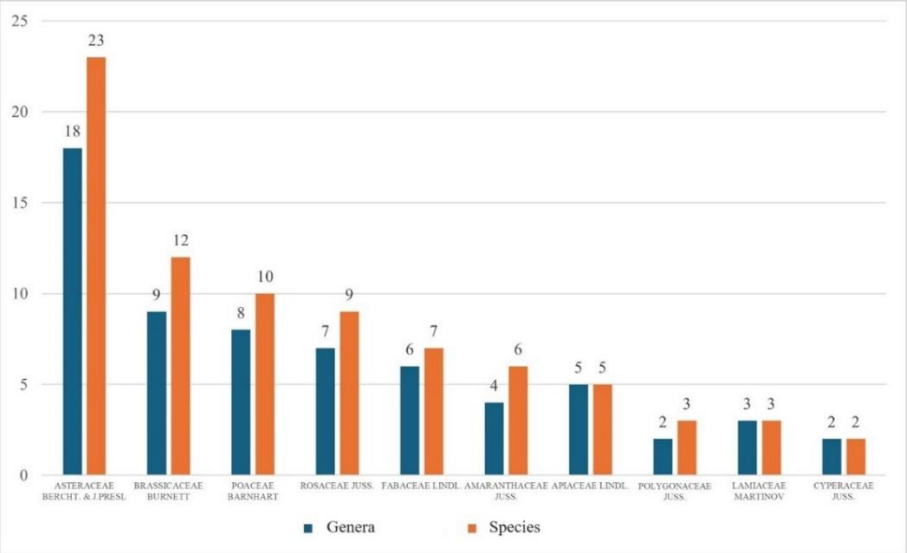

Figure 2 – 10 leading families of the Belbulak point

At the Belbulak point, plants were collected from a grass-mixed community with a projective coverage of 75%. There are 28 forage plant species in the Belbulak area, including *Bromus inermis* (Leyss.) Holub, *Trifolium pratense* L., *Rumex confertus* Willd., *Chenopodium album* L., *Artemisia terrae-albae* Krasch., *Medicago sativa* L., *Polygonum aviculare* L., *Brassica juncea* (L.) Czern., and others. No endemic species were identified.

The natural vegetation cover has been significantly degraded and is currently dominated by weed species such as *Xanthium strumarium*, *Sophora alopecuroides*, *Cannabis sativa* L., *Lepidium ruderale* L., *Bassia scoparia* (L.) Beck, *Atriplex patula* L. and others. The number of weed species in the Belbulak area is 70, which constitutes 67.9% of the total species.

A study of the vegetation cover at the Belbulak point in the Almaty region revealed a significant impact of historical pesticide use on the biodiversity of this area. Under conditions of high anthropogenic pressure, the plant community shows signs of degradation, as indicated by the predominance of weed species, which make up more than 67.9% of the total recorded plants. However, the presence of forage species suggests a partial preservation of the site's ecological value. The absence of endemic species underscores the negative impact of anthropogenic activities on the local flora.

References

Brühl, C. A., Zaller, J. G. Biodiversity decline as a consequence of an inappropriate environmental risk assessment of pesticides // Frontiers in Environmental Science, 2019 – Vol. 7. https://doi.org/10.3389/fenvs.2019.00177

Lavrenko, E.M., Korchagina, A.A. Polevaya geobotanika. Botanical Institute named after V.L. Komarov, USSR Academy of Sciences. – Moscow-Leningrad: USSR Academy of Sciences. – Vol. 1-4.